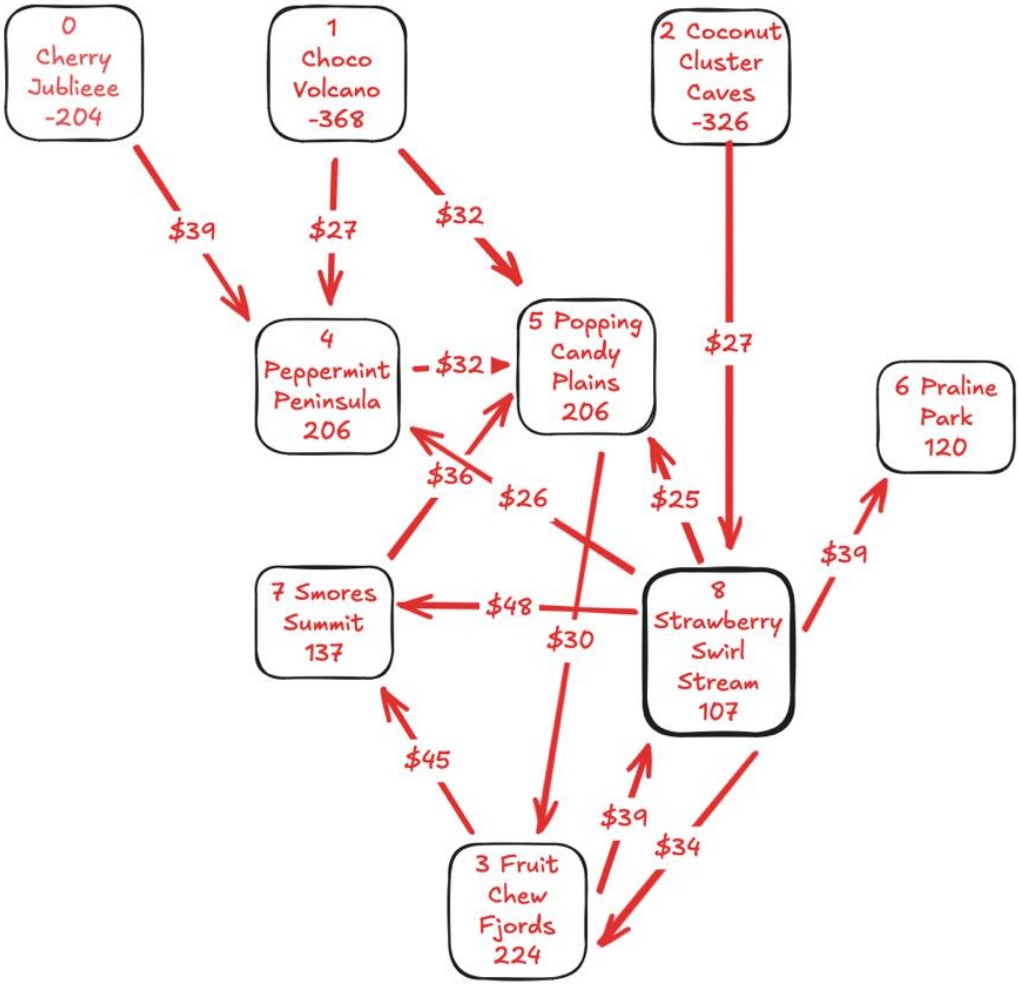
# Module 06 – Transshipment Problem

**Exploratory Data Analysis**



## Model Formulation

**MIN:**

+39X_04 + 27X_41 +32X_51 + 27X_28 +45X_37 +39X_38 +32X_45 +30X_53 + 36X_75 +34X_38 + 26X_84 + 25_X85 + 39X_86 + 48X_87

**Subject to:**

-X04 <= -204
-X14 - X15 <= -368
- X28 <= -326
- X37 - X38 + X53 + X83<= 224
-X45 - X14 - X04 +X84 <= 206
-X53 + X75 + X15 + X45+ X85 <= 206
+X86 <=120
-X75 + X87+X37 <=137
-X83 -X84 - X85 - X86 - X87 + X83 +X82 <=107

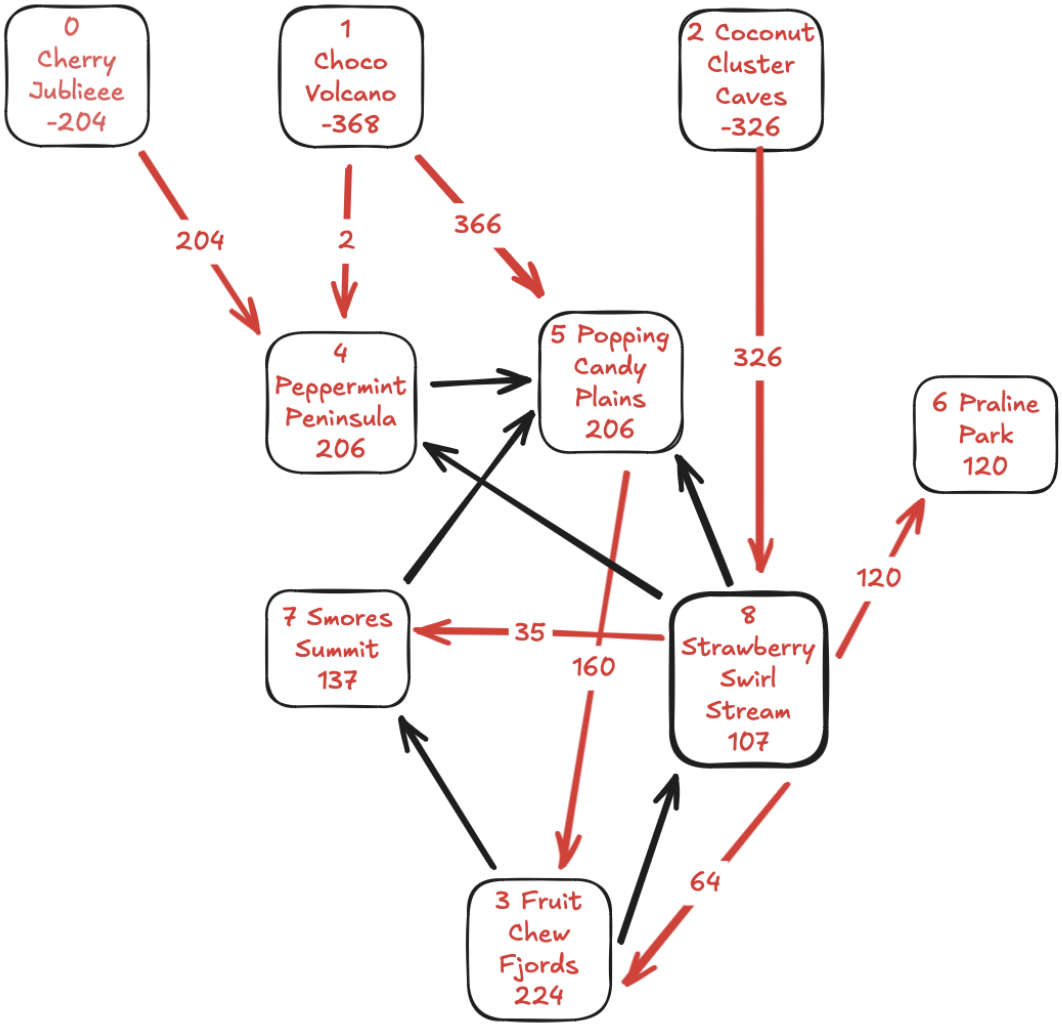
## Model Optimized for Minimal Transportation Cost

| Ship | from | to | cost_per_mile |
|---|---|---|---|
| 204 | 0 | 4 | 39 |
| 2 | 1 | 4 | 27 |
| 366 | 1 | 5 | 32 |
| 326 | 2 | 8 | 27 |
| 0 | 3 | 7 | 45 |
| 0 | 3 | 8 | 39 |
| 0 | 4 | 5 | 32 |
| 160 | 5 | 3 | 30 |
| 0 | 7 | 5 | 36 |
| 64 | 8 | 3 | 34 |
| 0 | 8 | 4 | 26 |
| 0 | 8 | 5 | 25 |
| 120 | 8 | 6 | 39 |
| 35 | 8 | 7 | 48 |

| | Nodes | Inflow | Outflow | Netflow | Supply Demand |
|---|---|---|---|---|---|
| 0 | Cherry Jubilee Junction | 0 | 204 | -204 | -204 |
| 1 | Choco Volcano | 0 | 368 | -368 | -368 |
| 2 | Coconut Cluster Caves | 0 | 326 | -326 | -326 |
| 3 | Fruit Chew Fjords | 224 | 0 | 224 | 224 |
| 4 | Peppermint Peninsula | 206 | 0 | 206 | 206 |
| 5 | Popping Candy Plains | 366 | 160 | 206 | 206 |
| 6 | Praline Park | 120 | 0 | 120 | 120 |
| 7 | Smores Summit | 35 | 0 | 35 | 137 |
| 8 | Strawberry Swirl Stream | 326 | 219 | 107 | 107 |

| Total Trnasportation Cost | 41860 |
|---|---|

This model is recommending the optimal solution to minimize total cost to the closest retailers. The transportation cost is $41,860. This will minimize the total cost for the company while also ensuring the demand is met.




**Areas that are in use are highlighted in RED**

## Model with Stipulation

*The* Balance-of-flow for this problem is changed to the total supply being greater than the total demand. When making the model greater it does not make it feasible. To make it work again you will change the <= to >=. This will allow the network flow problem to find a feasible solution.

| Ship | from | to | cost_per_mile |
|---|---|---|---|
| 306 | 0 | 4 | 39 |
| 0 | 1 | 4 | 27 |
| 368 | 1 | 5 | 32 |
| 326 | 2 | 8 | 27 |
| 38 | 3 | 7 | 45 |
| 0 | 3 | 8 | 39 |
| 100 | 4 | 5 | 32 |
| 262 | 5 | 3 | 30 |
| 0 | 7 | 5 | 36 |
| 0 | 8 | 3 | 34 |
| 0 | 8 | 4 | 26 |
| 0 | 8 | 5 | 25 |
| 120 | 8 | 6 | 39 |
| 99 | 8 | 7 | 48 |

| | Nodes | Inflow | Outflow | Netflow | Supply Demand |
|---|---|---|---|---|---|
| 0 | Cherry Jubilee Junction | 0 | 306 | -306 | -319 |
| 1 | Choco Volcano | 0 | 368 | -368 | -368 |
| 2 | Coconut Cluster Caves | 0 | 326 | -326 | -326 |
| 3 | Fruit Chew Fjords | 262 | 38 | 224 | 224 |
| 4 | Peppermint Peninsula | 306 | 100 | 206 | 206 |
| 5 | Popping Candy Plains | 468 | 262 | 206 | 206 |
| 6 | Praline Park | 120 | 0 | 120 | 120 |
| 7 | Smores Summit | 137 | 0 | 137 | 137 |
| 8 | Strawberry Swirl Stream | 326 | 219 | 107 | 107 |

| Total Trnasportation Cost | 54714 |
|---|---|